REMARKS

Claims 28, 29, 33 and 41-54 are amended and claims 55-67 are new. The claim amendments specify that the granular particles are formed by extrusion, and clarify some claim dependencies. New claims 55-67 include limitations that are common to pending claims 41-53. Therefore, the claim amendments and the new claims do not introduce new matter.

The Office has rejected the claims under 35 U.S.C. § 102 and § 103 over Parker and under 35 U.S.C. § 103 over the combination of Carduck, Parker, Dsiezak, Akimoto, and Casey. The rejections are respectfully traversed. The applicants believe a discussion of the invention would be helpful at this time to elucidate differences between the claimed extrudates and the cited documents.

The Invention

The specification describes extrusion methods useful for preparing granulated microorganisms that are porous, intact, and dead. The extruded microorganism granulates can be utilized in solvent extraction processes useful for isolating compounds within the microorganism. That the microorganisms are intact enhances the stability of extracted compounds because intact cell walls may protect the compounds from the environment (page 5, lines 20-24). That the microorganisms are dead also enhances the stability of the extracted compounds as the microorganism lacks active enzymes which may adversely affect the structural integrity of the compounds before extraction (page 10, line 15 to page 11, line 5). In addition, the porosity of the extruded microorganisms facilitates free solvent access to compounds within the cells (page 6, line 37). Furthermore, the extrusion process (page 6, lines 10-17) produces particles that are relatively dry and of substantially the same size (page 19, line 23).

The extrusion process results in a particular particle which is not obtainable if one uses other granulation techniques. The granulates of the invention are not intended to be edible, and extrusion facilitates solvent extraction by shaping the biomass into a form that maximizes the

surface area with which the solvent can come in contact, which allows a greater yield of the compound extracted from the cells. Thus, extrusion produces particles having pores which allow access to solvent inside the extruded particles. The porous, evenly sized, dead, intact features of the extruded microorganisms is not disclosed in any of the cited documents, and indeed this is hardly surprising since none of the cited documents teach or suggest methods of using microorganism particles in solvent extraction processes.

Rejections under Parker

Parker discusses non-viable dehydrated food products made of yeast cells. A fine yeast powder is aggregated by moistening the particles so that they become sticky and adhesive (column 2, line 26). The powdered particles thus adhere to each other in the form of aggregates which are a random shape and size, as evidenced by a particle size range of 4 to 20 microns (column 2, lines 23 and 28-30). The resulting material is then dried to yield a moisture content of 8.5% (column 2, lines 30-32 and 55-57). Please note that this moisture content (which equates to a dry matter content of 91.5%) is outside the range specified by claims 28 and 29. The resulting product forms as lumps on initial contact with water and is free flowing (column 2, lines 64 and 65).

As the Office will realize, the process described in Parker is not extrusion. There is no mention of an extruder, and instead of forcing the biomass through holes in a die plate under pressure, the fine powder is moistened to make the particles sticky so that they adhere to each other. This process described in Parker results in a very different product than an extrudate. As explained below, extrudates have different physical characteristics as compared to the non-extruded products of Parker.

First, the products of Parker are randomly shaped and sized, as evidenced by the fact the particles range in size from 4 to 20 microns. On the other hand, extrusion generates particles that are substantially the same size, or "monosized" (specification on page 19, line 23), where their size is determined by the size of the holes in the die plate of the extruder. Thus, purely from a

visual inspection, a person skilled in the art will immediately be able to tell the difference between the random size and shape of the Parker particles and the monosized particles resulting from extrusion.

Second, the Parker products will not have a porous structure because they are not formed by extrusion. Instead, Parker discusses an aggregation treatment whereby atomized water and moisture are distributed on the surface of the particles so that their surfaces become sticky. This process results in randomly shaped aggregates which do not have pores. Please note that Parker makes no mention of whether the resulting aggregates are porous, and given the method by which they are prepared, the skilled artisan would conclude that the products discussed in Parker are not porous, unlike the extrudates of the present invention.

The porosity of the claimed extrudates is not some slight or meaningless difference. The pores have a significant physical function of allowing solvent inside the extruded particles and maximizing the surface area contacted by solvent, which increases the yield of compounds extracted form the cells. The use of the extrudates for solvent extraction is completely different from the utility of the microorganisms discussed in Parker, as Parker discusses dehydrated yeast which is capable of being readily dispersed in cold water. Given the different method of manufacture of the particles discussed in Parker, the fact the particles in Parker would not be porous, and the different asserted use of the particles of Parker, the yeast discussed in Parker are intrinsically different than the claimed particles.

Third, the yeast discussed in Parker are instantly wettable and can be dispersed in water by simple stirring (column 2, lines 59-60). This is the opposite to what is desired in the present invention, because the extrudates are intended to be contacted with solvent, where the solvent may include water, for the purpose of extracting compounds therefrom. It would be highly disadvantageous if the claimed extrudates dissolved in a solvent since the extrudate would no longer exist and the porous structure would disappear. The porous structure is intended to survive solvent access, so that the large surface area between the solvent and cells is maintained. As Parker discloses yeast that readily disperse in cold water (column lines 62-63) in dried

powdered milk products (column 5, line 18), they differ from the claimed microorganism extrudates which do not readily dissolve in water.

Thus, it is clear that the yeast discussed in Parker do not anticipate the pending claims because they are not extruded microorganism granules that are monosized, porous, and not instantly wettable. For these reasons, the claimed subject matter is also inventive and not obvious in view of Parker because the document does not teach or suggest an extruded microorganism granulate that is monosized and porous. Furthermore, there are multiple reasons why there was no motivation to modify Parker to arrive at the claimed subject matter.

First, Parker teaches away from the claimed subject matter. As described above, the claimed cells which are produced by extrusion are not instantly wettable and they are porous. Parker teaches a non-porous yeast that is instantly wettable because the asserted purpose of the yeast is to include them in a product that can be readily dissolved in water with simple stirring. An instantly wettable product is opposite to what is desired in the present invention as the integrity of the claimed granulate is preferably preserved for use in solvent extraction.

Second, modifying the yeast discussed in Parker so that it is no longer instantly wettable would yield a product that would not work for its intended purpose, as the resulting milk product would not readily dissolve in water. See, *In re Fritch*, 972 F. 2d 1260, 1265, 23 USPQ.2d 1780, 1783 (Fed. Cir. 1992), where the Court of Appeals for the Federal Circuit (CAFC) found that a proposed modification is inappropriate for an obviousness inquiry when the modification renders the prior art reference inoperable for its intended purpose.

Third, there is no motivation to modify Parker to arrive at the claimed subject matter because the asserted utility in Parker is dramatically different than that of the claimed subject matter. The CAFC has held that there is no proper motivation to modify a document when the prior art does not teach the utility asserted for the claimed subject matter. *In re Lalu*, 747 F.2d 703, 707, 223 USPQ 1257, 1260 (Fed. Cir. 1984). Because Parker never mentions or suggests that the yeast disclosed therein could be used for solvent extraction, and because the yeast discussed in Parker could never be utilized for solvent extraction due their lack of pores and

propensity to instantly dissolve in water, the document does not provide any motivation to arrive at the claimed subject matter.

Thus, the claimed subject matter is novel and inventive over Parker and it is respectfully requested that the rejections presented under Parker be withdrawn.

Rejection under the combination of Carduck, Parker, Dsiezak, Akimoto, and Casey

The first document that the Office refers to is Carduck. This document refers to porous granules of active yeast that can be rehydrated. The yeast is described as having good vitality, which means the yeast is alive and can grow and reproduce (see column 1, lines 39 and 40). The granules are produced by extrusion, with a solid content of 30 to 40%, while a gas is introduced into the extruder chamber. These granular forms are intended to be used in bakery applications, since the yeast can regenerate with the addition of warm water (column 5, lines 11 and 12). The document has nothing to do with extraction of a compound from cells, let alone using a solvent. Instead, as with Parker, the intention is that the granules are added to water, and they dissolve. In the case of Carduck the granules have pores which allow rapid regeneration of the live yeast.

The Office cites Dsiezak and Parker for the proposition that the skilled artisan would be motivated to kill the cells of Carduck to generate a food supplement. Dsiezak is a general review document dealing with yeast, and it describes active compositions (such as bakers' yeast) and inactive dry yeast that have been killed by pasteurization. While the document discusses the use of inactive yeast as nutritional and flavor components, the inactive yeast are of no use to the brewers, wine makers, or bread makers discussed in Carduck.

The Office further cites Akimoto and Casey as they allegedly provide a motivation to modify Carduck to arrive at the claimed subject matter as it applies to *Mortierella*, *Aspergillus* and *Pichia*. Akimoto discusses a process for purifying bishomo-γ-linolenic acid. The document discusses a process in which microorganisms are cultured, collected from the culture broth, dried by lyophilization or air-drying, and then extracted with an organic solvent. The document does not disclose or suggest a process for granulating the cells by extrusion. Casey discusses a

process for preparing tetraacetylphytosphingosine (TAPS) using an F-60-10 mating type strain of *Pichia ciferrii*, including the steps of establishing a culture of *P. ciferrii,* separating the microorganism from the culture broth, drying the microorganisms overnight at 110° C, and extracting dried cells with a 4:1 mixture of ethyl acetate and methanol. Like Akimoto, the document does not disclose a process for granulating microorganisms by extrusion.

Despite the reasons argued by the Office, the claimed subject matter is inventive over the cited documents because there is no motivation to modify the teachings of Carduck with any of the teachings set forth in the other documents.

First, killing this yeast discussed in Carduck would frustrate the entire purpose of the live yeast. Carduck describes active yeast granules for the use of making bread. This utility is contradictory to the utility of the presently claimed microorganisms which are dead to promote solvent extraction. As the CAFC has held that there is no motivation to modify a document which does not teach the utility asserted for the claimed subject matter in *In re Lalu, supra*, Carduck may not be properly modified to arrive at dead microorganisms.

Second, the CAFC has held that there is no motivation to modify the teachings of a document when the modification would render the product inoperable in *In re Fritch, supra*. Killing the yeast in Carduck would not yield a yeast useful for leavening bread or fermenting alcoholic beverages and therefore would be contrary to the use of those granules intended by Carduck et al.

Third, while the Office suggests that the skilled artisan might kill the cells in Carduck to obtain a more digestible product with enhanced flavor, the skilled artisan would have no expectation that killing the yeast of Carduck would successfully lead to a more digestible product with enhanced flavor. There is nothing in Carduck, Dsiezak, or Parker about obtaining a more digestible bakery or alcoholic product. In addition, the Office's suggestion that dead yeast cells might improve the flavor of the bread and alcoholic beverages discussed in Carduck is purely speculative, and nothing in Carduck suggests that this would be desirable. Also, the flavors imparted by yeast are not necessarily compatible with the flavor of bread. For example, the

strong flavor of Marmite imparted by yeast extracts is hardly the sort of flavor that many would want to include in bread or alcoholic beverages.

Fourth, the CAFC has held that the Office may not use the applicant's disclosure to arrive at the claimed subject matter and that the requisite motivation must come from the prior art. *See In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ.2d 1529, 1531-1532 (Fed. Cir. 1988). A reason that the Office gives for killing the yeast in Carduck is to produce a product suitable for extraction of compounds from cells. It is respectfully submitted that the Office is only aware of this use of extrudates because of the present invention, as the cited documents do not suggest extrudates can be utilized in solvent extraction processes. Akimoto and Casey mention solvent extraction, but none of the cells discussed in those documents have been extruded. Thus, there is nothing in Carduck which suggests that extrudates can be utilized in solvent extraction processes, and Akimoto and Casey provide no suggestion that the skilled artisan should produce an extrudate and extract the extrudate with solvent.

For these reasons, there would be no motivation to combine any of the cited documents, and therefore all of the claims currently on file are inventive.

Conclusions

Claims 28, 29, 33, and 41-54 are amended, claims 55-67 are new, and no new matter has been added. The claimed microorganism extrudates are novel and inventive over Parker because Parker does not disclose yeast which are monosized, porous, and not instantly wettable. Furthermore, Parker does not teach or suggest the utility of using the claimed granules for solvent extraction, and modifying the yeast of Parker to being non-porous and not instantly dissolvable would render the Parker invention inoperable. Moreover, the skilled artisan would not have killed the yeast discussed in Carduck because doing so would frustrate the asserted utility in the document as well as render the yeast inoperable for the intended purpose of leavening bread. In addition, there is no motivation to kill the yeast of Carduck because there was no expectation that the resulting yeast would act as a flavor enhancer or yield a more

digestible bread product. Thus, Parker and Carduck do not result in the claimed subject matter, nor was there any motivation to modify their teachings. It is therefore respectfully requested that the Office withdraw the rejections of the pending claims.

In the unlikely event that the transmittal letter is separated from this request and the Patent Office determines that a fee is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952**, referencing docket number 251502006900. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Respectfully submitted,

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By: _____

Bruce Grant
Registration No. 47,608

Morrison & Foerster LLP
3811 Valley Centre Drive
Suite 500
San Diego, California 92130-2332
Telephone: (858) 720-7962
Facsimile: (858) 720-5125

EXHIBIT A

28. (Amended) A composition [consisting essentially of] comprising granular particles formed by extrusion of non-disrupted dead microbial cells from a biomass which particles

(a) are obtained by [granulating] extruding the biomass having a dry matter content of 25 to 80%;

(b) have a dry matter content of at least 30% but less than 70%; and

(c) have a structure that on drying allows isolation or extraction of a desired compound from the dead cells with a solvent through pores and/or channels.

29. (Amended) A composition comprising granular particles of dead fungal cells from a biomass which particles

(a) are obtained by [granulating] extruding the biomass; and

(b) have a dry matter content of at least 30% but less than 70%.

33. (Amended) A composition according to claim 27, 28, 29 or 54 wherein the granular particles or dried granules have a diameter of from 0.3 to 10 mm and a length that is, on average, 2 to 6 times the diameter.

41. (Amended) The granulate according to claim 27, 28, or 29 wherein the microorganism is a fungus.

42. (Amended) The granulate according to claim [37] 27, 28, or 29 wherein the fungus belongs to the order *Mucorales*.

43. (Amended) The granulate according to claim [38] 27 or 28 wherein the fungus belongs to the genus *Mortierella*.

44. (Amended) The granulate according to claim [39] 27 or 28 wherein the fungus is *Mortierella alpina*.

45. (Amended) The granulate according to claim 27 or 28 wherein the compound is a polyunsaturated fatty acid (PUFA), optionally contained in a lipid.

46. (Amended) The granulate according to claim 4[1]5 wherein the polyunsaturated fatty acid is a C18, C20 or C22 [ω]Ω-3- or a C18, C20 or C22 [ω]Ω-6-polyunsaturated fatty acid.

47. (Amended) The granulate according to claim 4[2]6 wherein the polyunsaturated fatty acid is a C20 or C22 [ω]Ω-3- or a C20 or C22 [ω]Ω-6-polyunsaturated fatty acid.

48. (Amended) The granulate according to claim [42] 27 or 28 wherein the compound is arachidonic acid (ARA), eicosapentaenoic acid (EPA) and/or docosahexaenoic acid (DHA).

49. (Amended) The granulate according to claim [37] 27 or 28 wherein the fungus belongs to the genus *Phycomyces*, *Blakeslea* or *Aspergillus*.

50. (Amended) The granulate according to claim 27 or 28 wherein the microorganism is a yeast.

51. (Amended) The granulate according to claim 27 or 28 wherein the compound is tetra-acetyl-phyto-sphingosine (TAPS).

52. (Amended) The granulate according to claim 27 or 28 wherein the microorganism is a bacterium.

53. (Amended) The granulate according to claim 27 or 28 wherein the compound is a vitamin.

54. (Amended) A composition which comprises dried porous granules consisting essentially of dead microbial cells, the dried granules being obtained by drying granular

particles, themselves obtained by [granulating] extruding a microbial biomass, said resultant dried granules having a dry matter content of at least 80% and a structure that allows, via the pores, solvent access to a compound contained within the non-disrupted dead cells to isolate or extract the compound therefrom.